

# UC-8481 Series

**Industrial RISC-based mobile Linux computer with cellular, Wi-Fi, and GPS modules, 2 Ethernet, 2 serial, 2 USB 2.0 ports, & 2 mini PCIe sockets**



- > Intel XScale IXP435 533 MHz processor
- > 512 MB DDR2 SDRAM
- > 512 MB NAND Flash for data storage
- > 32 MB NOR Flash to store OS
- > Fanless and rugged design for rolling stock applications that require EN 50155 standards
- > Extra Wi-Fi and cellular slots for cross-operator expansions
- > Wi-Fi, Cellular, and GPS modules for full communications mobility
- > Independent, software-based power control of cellular modules
- > Ready-to-run embedded Linux operating system
- > -25 to 70°C wide temperature models available



## Overview

The UC-8481 embedded computer comes with 2 RS-232/422/485 serial ports, 2 Ethernet ports, 4 digital input channels, 4 digital output channels, a CompactFlash socket, and 2 USB 2.0 ports.

The computer uses the Intel XScale IXP435 533 MHz RISC CPU. This powerful computing engine supports several useful communication functions, but will not generate too much heat. The built-in 32 MB NOR Flash ROM and 512 MB SDRAM give you enough memory to run your application software directly on the UC-8481, and the 512 MB NAND Flash can be used to provide additional data storage.

Mostly importantly, the UC-8481 series comes with seven connectors that allow users to connect various wireless and GPS modules, making it particularly well-suited for rolling stock and moving vehicles. The

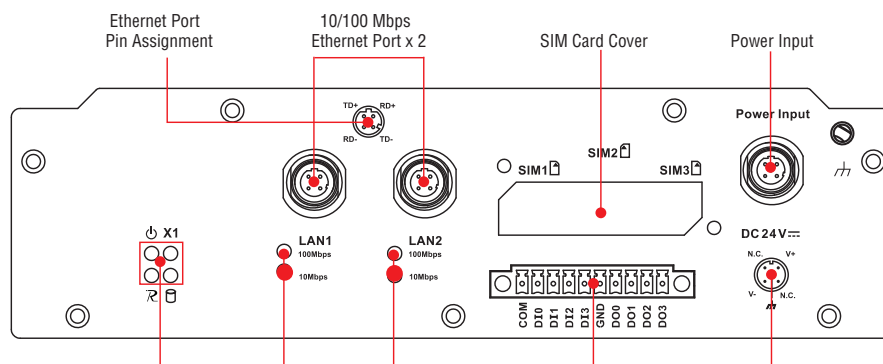
UC-8481 is a convenient cornerstone for customizing intelligent, cost-effective wireless communication platforms.

With an embedded Linux operating system pre-installed, the UC-8481 series provides an open software platform perfect for custom-authored software. Software written on desktop PCs can be easily ported to the UC-8481 via a common compiler, without any modification of code. This makes the UC-8481 an optimal solution for industrial applications, allowing ample customization with minimal cost and effort.

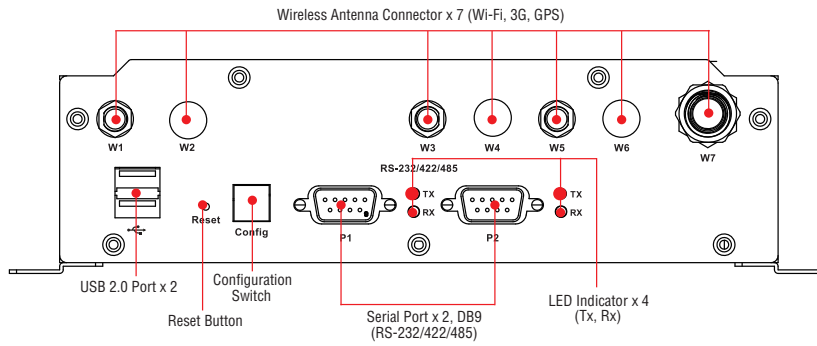
The UC-8481 also comes in a wide-temperature model designed to operate reliably in extremes from -25° to 70° C.

## Appearance

Front View

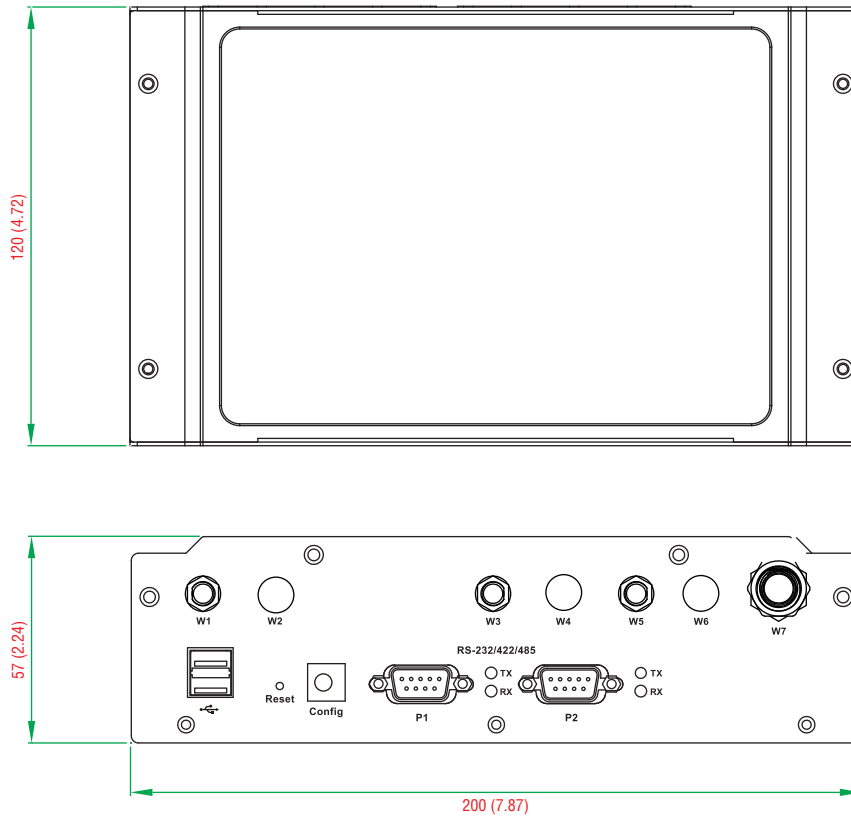


## Rear View



## Dimensions

Unit: mm (inch)



## Hardware Specifications

### Computer

**CPU:** Intel XScale IXP435, 533 MHz

**OS (pre-installed):** Linux

**DRAM:** 512 MB DDR2 SDRAM onboard

#### Flash:

32 MB NOR Flash onboard to store OS

512 MB NAND Flash, up to 1 GB for OS file system, caching storage, and data logger

**USB:** USB 2.0 hosts x 2

### Storage

**Storage Expansion:** CompactFlash socket

### Ethernet Interface

**LAN:** 2 auto-sensing 10/100 Mbps ports (M12)

**Magnetic Isolation Protection:** 1.5 kV built in

### GPS Module (U-Blox LEA-6S)

#### Receiver Types:

- 50-channel U-blox 6 engine
- GPS L1 C/A code
- SBAS: WAAS, EGNOS, MSAS, GAGAN

#### Acquisition

- Cold starts: 28s
- Warm starts: 28s
- Aided starts: 1s
- Hot starts: 1s

#### Sensitivity

- Tracking: -160 dBm
- Reacquisition: -160 dBm
- Cold starts: -147 dBm

#### Timing accuracy

- RMS: 30 ns
- 99%: <60 ns
- Granularity: 21 ns

#### Accuracy

- Position: 2.5m CEP
- SBAS: 2.0m CEP

**Protocols:** NMEA, UBX binary, max. update rate: 5Hz (ROM version)

**Time Pulse:** 0.25Hz to 1KHz

**Velocity Accuracy:** 0.1 m/s

**Heading Accuracy:** 0.5 degrees

**A-GPS:** Supports AssistNow Online and AssistNow Offline, OMA SUPL compliant

**Operational Limits:** Velocity: 500m/s (972 knots)

**Connector Type:** TNC

### WLAN Module (Atheros AR9220)

**WAPN001:** IEEE802.11a/b/g/n wireless LAN module with U.FL antenna connector

**Standards:** IEEE802.11a/b/g/n for wireless LAN

**Connector Type:** QMA connector (female type) x 2

**Mode:** Client

### Cellular Module (Cinterion PH8)

**Frequency Bands:** GSM/GPRS/EDGE/UMTS/HSPA+

#### Band Options:

- Five band UMTS(WCDMA/FDD)
- 800/850/1900 AWS and 2100 MHz
- Quad-band GSM: 850/900/1800/1900 MHz

#### HSDPA/HSUPA Data Rates:

DL: 3.6/7.2/14.4 Mbps; UL: 2.0/5.76 Mbps

#### UMTS Data Rates:

DL: max 384 Kbps; UL: max 384 Kbps

#### EDGE Class 12:

DL: max 237 Kbps; UL: max 237 Kbps

#### GPRS Class 12:

DL: max 85.6 Kbps; UL: max 85.6 Kbps

**Connector Type:** QMA connector (female type) x 1

### Serial Interface

**Serial Standards:** 2 RS-232/422/485 ports, software-selectable (DB9)

**Console Port:** RS-232 (Tx, Rx, GND), 4-pin pin header output (115200, n, 8, 1)

### Serial Communication Parameters

**Data Bits:** 5, 6, 7, 8

**Stop Bits:** 1, 1.5, 2

**Parity:** None, Even, Odd, Space, Mark

**Flow Control:** RTS/CTS, XON/XOFF, ADDC® (automatic data direction control) for RS-485

**Baudrate:** 50 bps to 921.6 Kbps (supports non-standard baudrates; see user's manual for details)

### Serial Signals

**RS-232:** Tx, Rx, DTR, DSR, RTS, CTS, DCD, GND

**RS-422:** Tx+, Tx-, Rx+, Rx-, GND

**RS-485-4w:** Tx+, Tx-, Rx+, Rx-, GND

**RS-485-2w:** Data+, Data-, GND

### Digital Input

**Input Channels:** 4, source type

**Input Voltage:** 0 to 30 VDC

#### Digital Input Levels for Dry Contacts:

- Logic level 0: Close to GND
- Logic level 1: Open

#### Digital Input Levels for Wet Contacts:

- Logic level 0: +3 V max.
- Logic level 1: +10 V to +30 V (COM to DI)

**Connector Type:** 10-pin screw terminal block (4 points, COM, GND)

**Isolation:** 2 kV optical isolation

### Digital Output

**Output Channels:** 4, sink type

**Output Current:** Max. 200 mA per channel

**On-state Voltage:** 24 VDC nominal, open collector to 30 V

**Connector Type:** 10-pin screw terminal block (4 points, GND)

### LEDs

**System:** Power, Ready, Storage, Programmable

**LAN:** 10M/Link x 2, 100M/Link x 2 (on connector)

**Serial:** Tx x 2, Rx x 2

**Reset Button:** Supports "Reset to Factory Default"

### Physical Characteristics

**Housing:** SECC sheet metal (1 mm)

**Weight:** 1 kg

**Dimensions:** 200 x 57 x 120 mm (7.87 x 2.24 x 4.72 in)

**Mounting:** DIN rail, wall

### Environmental Limits

#### Operating Temperature:

Standard Models: -25 to 55°C (-13 to 131°F)

Wide Temp. Models: -25 to 70°C (-13 to 158°F)

#### Storage Temperature:

Standard Models: -25 to 75°C (-13 to 167°F)

Wide Temp. Models: -40 to 80°C (-40 to 176°F)

**Ambient Relative Humidity:** 5 to 95% (non-condensing)

**Anti-vibration:** IEC 61373 standard

**Anti-shock:** IEC 61373 standard

### Power Requirements

**Input Voltage:** 24 VDC (9 to 48 V), M12 connector

**Power Consumption:** 20 W

- 833 mA @ 24 VDC

### Standards and Certifications

**Safety:** UL 60950-1, EN 60950-1

**EMC:** EN 55022 Class B, EN 55024-4-2, EN 55024-4-3, EN 55024-4-4, FCC Part 15 Subpart B Class B

**Rail Traffic:** EN 50155, EN 50121-2-3, EN 50121-4, IEC 61373

## Reliability

**Alert Tools:** Built-in buzzer and RTC (real-time clock)

**Automatic Reboot Trigger:** Built-in WDT (watchdog timer)

## : Software Specifications

### Linux

**OS:** Linux 2.6.38

**File System:** JFFS2, NFS, Ext2, Ext3, YAFFS2

**Internet Protocol Suite:** TCP, UDP, IPv4, IPv6, SNMPv1, ICMP, ARP, HTTP, CHAP, PAP, DHCP, NTP, NFS, SMTP, Telnet, FTP, TFTP, PPP, PPPoE

**Internet Security:** OpenVPN, iptables firewall, OpenSSL

**Web Server (Apache):** Allows you to create and manage web sites; supports PHP and XML

**Terminal Server (SSH):** Provides secure encrypted communications between two un-trusted hosts over an insecure network

**Dial-up Networking:** PPP Daemon for Linux that allows Unix machines to connect to the Internet through dialup lines, using the PPP protocol, as a PPP server or client. Works with 'chat', 'dip', and 'diald', among (many) others. Supports IP, TCP, UDP, and (for Linux) IPX (Novell).

## : Ordering Information

### Available Models

**UC-8481-LX:** RISC-based industrial wireless mobile computer with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 1 cellular module, 1 Wi-Fi module, 1 GPS module, 2 Mini PCIe sockets (USB interface), Linux OS, -25 to 55°C operating temperature (EN 50155 Class T1)

**UC-8481-T-LX:** RISC-based industrial wireless mobile computer with 2 LANs, 2 serial ports, 4 DIs, 4 DOs, 2 USB 2.0 hosts, CF, 1 cellular module, 1 Wi-Fi module, 1 GPS module, 2 Mini PCIe sockets (USB interface), Linux OS, -25 to 70°C operating temperature (EN 50155 Class T3)

### Optional Accessories (can be purchased separately)

**PWR-24250-DT-S1:** Power adaptor

**PWC-C7US-2B-183:** Power cord with 2-pin connector, USA plug

**PWC-C7EU-2B-183:** Power cord with 2-pin connector, Euro plug

**PWC-C7UK-2B-183:** Power cord with 2-pin connector, British plug

**PWC-C7AU-2B-183:** Power cord with 2-pin connector, Australia plug

**PWC-C7CN-2B-183:** Power cord with 2-pin connector, China plug

### M12 Connectors (can be purchased separately)

**M12A-5P-IP68:** Field-installation A-coded screw-in power connector, 5-pin female M12 connector, IP68-rated

**M12D-4P-IP68:** Field-installation D-coded screw-in Ethernet connector, 4-pin male M12 connector, IP68-rated

### M12 Cables (can be purchased separately)

**CBL-M12(FF5P)/Open-100 IP67:** 1-meter A-coded M12-to-5-pin power cable, 5-pin female M12 connector, IP67-rated

**CBL-M12D(MM4P)/RJ45-100 IP67:** 1-meter D-coded M12-to-RJ45 Cat-5C UTP Ethernet cable, 4-pin male M12 connector, IP67-rated

## Warranty

**Warranty Period:** 5 years (does not apply to cellular module)

**Details:** See [www.moxa.com/warranty](http://www.moxa.com/warranty)

**Note:** These hardware specifications describe the embedded computer unit itself, but not its official accessories. In particular, the wide temperature specification does not apply to accessories such as power adaptors and cables.

**Watchdog:** Features a hardware function to trigger system reset in a user specified time interval (Moxa API provided)

**Wireless:** wpa\_supplicant is configured using a text file that lists all accepted networks and security policies, including pre-shared keys.

**GPS:** gpsd is a daemon that receives data from a GPS receiver, and provides the data back to multiple applications such as Kismet or GPS navigation software.

### Application Development Software:

- Moxa API Library (Watchdog timer, Moxa serial I/O control, Moxa DI/DO API)

- GNU C/C++ cross-compiler, supports EABI

- GNU C library

- GDB source-level debugging server

**Software Protection:** Encryption tool for user executable files (based on patented Moxa technology)

### UC-8481 Wi-Fi Accessory Package

**WAPN001:** Wireless LAN module, supporting IEEE 802.11 a/b/g/n

**Wireless Antenna Connector and Cable:** QMA (Female) antenna connector with 140 mm cable to Wi-Fi module

**Installation Kit:** Bronze screws x 3, M2.5 screws x 3, thermal pad x 1

### UC-8481 PH8 Cellular Accessory Package

**EPM-PH8:** Cellular Module

**Wireless Antenna Connector and Cable:** QMA (Female) antenna connector with 140 mm cable to cellular module

**Installation Kit:** Bronze screw x 1, M2.5 screw x 1, thermal pad x 1

### WLAN Cable and Antenna

**Cable:** QMA (male) to SMA (male) adaptor with 50 cm cable

**Antenna:** 2 dual-band omni-directional antenna (2 dBi, RP-SMA, 2.4/5 GHz)

### Cellular Cable and Antenna

**Cable:** QMA (male) to SMA (female) adaptor with 50 cm cable

**Antenna:** Omni 1 dBi rubber SMA antenna

### GPS Cable and Antenna






**Cable:** TNC to SMA (female) adaptor with 50 cm cable

**Antenna:** 26 dBi, 1572 MHz, L1 band antenna

### Package Checklist

- UC-8481 embedded computer
- Wall mounting kit
- DIN rail mounting kit
- CBL-4PINDB9F-100: 100 cm console port cable; 4 pin header connector to female DB9 connector
- Documentation and software CD or DVD
- Quick installation guide (printed)

## : Accessory Packages

Ethernet	Item	Type	Model Name	Description
	1	Cable	CBL-M12D(MM4P)/RJ45-100 IP67	1-meter D-coded M12-to-RJ45 Cat-5C UTP Ethernet cable, 4-pin male M12 connector, IP67-rated
	2	Connectors	M12D-4P-IP68	Field-installation D-coded screw-in Ethernet connector, 4-pin male M12 connector, IP68-rated
Power				
	1	Cable	CBL-M12(FF5P)/OPEN-100 IP67	1-meter A-coded M12-to-5-pin power cable, 5-pin female M12 connector, IP67-rated
	2	Power Adapter Kit	PWR-24250-DT-S1 Adapter w/US Plug	Power Adapter, Power jack, M12 Connector, Power Cord
			PWR-24250-DT-S1 Adapter w/EU Plug	Power Adapter, Power jack, M12 Connector, Power Cord
			PWR-24250-DT-S1 Adapter w/AU Plug	Power Adapter, Power jack, M12 Connector, Power Cord
			PWR-24250-DT-S1 Adapter w/UK Plug	Power Adapter, Power jack, M12 Connector, Power Cord
			PWR-24250-DT-S1 Adapter w/CN Plug	Power Adapter, Power jack, M12 Connector, Power Cord
Wi-Fi				
	1	Cable	A-CRF-RFQMAM-R2-50	QMA (male) to SMA (male) adaptor with 50cm cable
	2	Antenna	ANT-WDB-ARM-02	Omni 1 dBi rubber SMA antenna
	3	Modules	UC-8481 WiFi Accessory Package	(WAPN001, Wireless Module)
Cellular				
	1	Cable	A-CRF-QMAMSF-R2-50	QMA (male) to SMA (female) adaptor with 50cm cable
	2	Antenna	ANT-WCDMA-ASM-1.5	Omni 1 dBi rubber SMA antenna
	3	Modules	UC-8481 HSPA Cellular Acc. Package	(PH8, Cellular Module)
GPS				
	1	Cable	A-CRF-CTPSF-R2-50	TNC to SMA (female) adaptor with 50 cm cable
	2	Antenna	ANT-GPS-OSM-05-3M	26 dBi, 1572 MHz, L1 band SMA antenna